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THE GEOGRAPHICAL DISTRIBUTION OF THE STUDENT BODY AT A NUMBER OF UNIVERSITIES AND COLLEGES

THE accompanying table explains the geographical distribution of the student body of twelve American universities and four New England colleges and one Pennsylvania college for the academic year 1906–7, the summer session students being in every instance omitted. *Brown, Ohio State* and *Virginia* have been added to the table, while the *Lafayette* figures are omitted this year. The *University of California* figures include only the students in the academic colleges and are exclusive of the 174 students in the professional schools in San Francisco. In making comparisons with 1905–6, it should also be noted that the *California* figures in last year's table were those of 1904–5.

Comparing the attendance by divisions of the six eastern universities (*Columbia, Cornell, Harvard, Pennsylvania, Princeton, Yale*) with the corresponding figures for the same universities included in a similar table published in SCIENCE, N. S., Vol. XXIV., No. 606 (August 10, 1906), pp. 166–173, we note in the first place that there has been a gain for these universities, taken as a whole, in every division, the largest increase in the actual number of students, leaving the North Atlantic division—in which all of these six universities are located—out of consideration, having been recorded in the North Central division, where there has been an increase of 117 students, followed by foreign countries

RESIDENCES OF STUDENTS (A) *United States*

1906-1907	Amherst	Brown	California	Columbia	Cornell	Dartmouth	Harvard (Incl. Radcliffe)	Illinois	Lehigh	Michigan	Ohio State	Pennsylvania	Princeton	Virginia	Williams	Wisconsin	Yale
North Atlantic Division.	**381**	**867**	**9**	**3306**	**2626**	**970**	**3593**	**35**	**536**	**505**	**64**	**2960**	**948**	**43**	**378**	**48**	**2309**
Connecticut	17	27		62	47	19	48	2	6	10	3	35	16	2	22		1107
Maine		10		20	15	44	116		1	4	1	13	1		5	1	19
Massachusetts	170	189	3	79	87	500	2456	8	15	15	7	69	27	1	95	4	184
New Hampshire		41		11	4	233	81		1	5	3	8	2		2	2	14
New Jersey	15	19		388	157	7	69	4	55	15	2	226	279	8	36	7	107
New York	137	59	5	2607	1986	76	524	14	54	277	22	136	288	13	192	23	639
Pennsylvania	27	16	1	112	314	8	181	5	403	165	25	2457	330	17	15	9	196
Rhode Island	7	488		10	7	10	93	1	1	7		10	4	2	2	2	27
Vermont	8	18		17	9	73	25	1		7	1	6	1		9		16
South Atlantic Division.	**9**	**10**	**3**	**113**	**176**	**8**	**128**	**17**	**106**	**47**	**11**	**165**	**105**	**537**	**3**	**19**	**102**
Delaware		2		2	9	1	5		7			40	6	5			16
District of Columbia	4	3	1	7	48	6	37	5	22	13	1	29	15	11	2	4	19
Florida				4			4	1		6		5	4	10			9
Georgia		1	1	23	7		14	1		4		13	2	13		6	12
Maryland	4	2		16	53		23	3	54	5	4	34	49	31	1	6	14
North Carolina				21	12		10	2	1	2		12	5	18			10
South Carolina			1	15	4	1	12	1		2		5	6	15		1	4
Virginia		1		17	35		12	1	14	6	1	18	12	412			11
West Virginia	1	1		8	8		11	3	8	9	5	9	6	22		2	7
South Central Division.	**6**	**9**	**5**	**83**	**93**	**5**	**102**	**48**	**8**	**68**	**22**	**61**	**55**	**156**	**3**	**22**	**79**
Alabama	1			19	13		13	4	1	4	1	18	5	30		2	2
Arkansas				2	6		6	7		6		4	4	11		3	1
Indian Territory					2			4		3							1
Kentucky	2	3		17	15	3	33	11	3	23	8	15	20	38	2	8	25
Louisiana			1	7	7		10	2		2	1		1	10		1	8
Mississippi		1		8	13	1	2	2	1	2		4	5	20		2	3
Oklahoma		1		4	3		8	7		13							2
Tennessee	1	2		14	13		16	2	2	4	4	6	9	34		1	17
Texas	2	2	4	12	21	1	14	9	1	11	8	14	11	13	1	5	20
North Central Division.	**62**	**18**	**27**	**329**	**377**	**122**	**522**	**3597**	**13**	**3436**	**1908**	**176**	**184**	**33**	**86**	**3486**	**577**
Illinois	16	4	5	38	102	67	116	3203	3	296	5	15	48	3	35	214	143
Indiana	1	2	3	41	31	5	37	65		173	17	13	18	3	6	33	29
Iowa	5	3	7	25	20	7	49	78	1	70	4	20	12		5	81	30
Kansas		1	2	14	10	2	15	24	1	27		14	3	1	1	9	17
Michigan	6			28	30	3	24	29	3	2358	3	6	17	2	3	25	36
Minnesota	2		2	23	11	2	35	19	1	19	3	11	9	1	9	31	53
Missouri	15	4	1	29	20	7	59	40		70	1	16	15	14	2	23	63
Nebraska	2		1	12	7	6	11	13	2	20		1	8		2	21	17
North Dakota			1	7	2	3	2	3	1	3	1		3			10	1
Ohio	10		4	80	128	17	141	33	1	342	1870	69	42	7	14	29	159
South Dakota				2		2	7	15		18		1	2			16	7
Wisconsin	5	4	1	30	16	1	26	75		40	4	10	7	2	9	2994	22
Western Division	**9**	**1**	**2655**	**105**	**86**	**20**	**126**	**53**	**3**	**155**	**6**	**40**	**36**	**10**	**6**	**37**	**99**
Arizona			1	2				3		4							3
California	2		2592	29	21	5	55	8		27	1	2	8	4	2		32
Colorado	3		8	25	22	12	27	13		40	3	12	15	1	2	8	31
Idaho			3	1	1	1	1	2		4		2				2	1
Montana			1	15	6		5	4		32		1	5	3		9	7
Nevada			3	2			2	1				1		1			1
New Mexico			1	1			3			6						4	
Oregon	3	1	30	4	14		10	3	1	9	1	1	2	1	1	2	10
Utah			1	13	9		6	6	1	11	1	10	4			1	4
Washington	1		15	11	10	2	16	13	1	13		11	1			11	9
Wyoming				2	3		1			9			1		1		1
Insular and Non-Contiguous Territories			**13**	**7**	**22**		**13**	**16**	**3**	**13**	**10**	**7**	**1**	**1**		**11**	**10**
Alaska			3														
Hawaiian Islands			6	4	3		9			2		2					5
Philippine Islands			4		13		1	16		5	8	2				10	4
Porto Rico				3	6		3		3	6	2	3	1	1		1	1
Total	**467**	**905**	**2712**	**3943**	**3380**	**1125**	**4484**	**3766**	**669**	**4224**	**2021**	**3409**	**1329**	**780**	**476**	**3623**	**3176**

with an increase of 64 students, and the South Atlantic division with an increase of 42 students. In the South Central and Western states and in the insular possessions these eastern universities have made only a slight gain. The total increase in divisions outside of the North Atlantic this year is larger than it was last (189 against 91), while there has been a small decrease in the gain of students from foreign countries (64 against 87). The figures show conclusively that the six eastern universities mentioned, taken as a whole, are more than holding their own in

(B) Foreign Countries

1906-1907	Amherst	Brown	California	Columbia	Cornell	Dartmouth	Harvard (Incl. Radcliffe)	Illinois	Lehigh	Michigan	Ohio State	Pennsylvania	Princeton	Virginia	Williams	Wisconsin	Yale
North America	**1**	**3**	**6**	**46**	**47**	**3**	**54**	**8**	**17**	**24**	**6**	**51**	**6**			**17**	**25**
Canada	1	1	4	30	23	1	43	4	1	18	2	15	3			8	23
Central America				5	4		2					16				1	
Cuba		1	2	8	11		1		10		2	9	2			1	
Mexico				2	9	2	5	4	3	5	1	5	1			6	1
West Indies		1		1			3		3	1	1	6				1	1
South America			**6**	**13**	**27**		**4**	**4**	**3**	**2**	**13**	**20**		**3**		**6**	**2**
Argentine Republic			3	1	14		3	3			13	3				6	
Brazil			1	1	5							8		2			1
Chili			1	2								5					1
Colombia				3			1	1	2	2		1					
Ecuador			1	4	2				1			2					
Peru				2	5							1		1			
Uruguay					1												
Europe	**1**	**1**	**5**	**39**	**23**		**33**	**6**		**9**	**9**	**45**	**6**			**5**	**18**
Austria-Hungary				1			1					3					
Belgium				1													
Bulgaria				1	1		1			1	1						
Denmark												1					1
France	1	1		4	2		4					7					3
Germany			2	8	2		3			5	1	8					1
Great Britain and Ireland			2	7	5		14			1		8	5			1	7
Greece				2													
Holland			1	1	2			1		2		5				2	
Iceland																1	
Italy				3			3	1				1					1
Norway				1	1			2									1
Portugal							1					2				1	
Rumania											2						
Russia				5	4		1	1			2	6					
Spain				1				1				1					
Sweden				1	2							2					
Switzerland					2		2					1					
Turkey				3	2		3				3		1				4
Asia	**6**	**6**	**27**	**44**	**36**	**1**	**35**	**7**	**2**	**21**	**8**	**22**	**6**	**2**	**3**	**8**	**38**
Burmah										1							
Ceylon												3	1				
China		5	15	9	16		20		1	2	1	4		1			10
Corea							1										
India	2	1	6	5	10		3	4	1	5		1					1
Japan	4		3	27	8		10	2		9	3	12	5		3	8	22
Persia				1													
Siam			3														
Turkey (in Asia)				2	2	1	1	1		4	4	2		1			5
Africa			**1**	**2**	**1**		**4**			**1**					**1**		**2**
Egypt				1													
South Africa			1	1	1		4			1					1		2
Australasia			**1**	**2**	**3**		**3**			**1**	**1**	**32**					**2**
Australia			1	2	3						1	22					2
New Zealand							3			1		10					
Total (Foreign Countries)	8	10	46	146	137	4	133	25	22	58	37	170	18	5	4	36	87
Total (United States)	467	905	2712	3943	3380	1125	4484	3766	669	4224	2021	3409	1329	780	476	3623	3176
Grand Total	475	915	2758	4089	3517	1129	4617	3791	691	4282	2058	3579	1347	785	480	3659	3263

sections outside of the North Atlantic, this being especially true of the North Central division. Calculated on a percentage basis, the total gain of the six universities in the North Atlantic division during the past year amounted to 3.51 per cent., as against a gain of 5.73 per cent. outside of the division mentioned. In the South Atlantic division all of these institutions show a gain, with the exception of *Cornell;* in the South Central states gains by *Columbia, Cornell* and *Harvard* more than compensate for the losses of *Pennsylvania, Princeton* and *Yale;* in the North Central division all of them with the exception of *Cornell* and *Princeton* show substantial gains; in the western states *Columbia* alone has suffered a loss; in the insular territories the registration has undergone no change worthy of mention in any of the institutions, while in foreign countries *Columbia* and *Princeton* show a slight de-

crease. Comparing this year's figures with those of two years ago, we observe that the most substantial gains have been made by *Columbia* (67), *Pennsylvania* (37) and *Yale* (71) in the North Central division, by *Yale* (21) in the Western division, and by *Columbia* (29), *Cornell* (37), *Harvard* (39) and *Pennsylvania* (44) in foreign countries. At Columbia the attendance from outside of the North Atlantic states has increased from 15.07 per cent. to 19.15 per cent. during the last five years.

Taking the universities in the accompanying table by divisions, we find that *Harvard* and *Columbia* have the largest representation in the North Atlantic division, *Pennsylvania, Cornell, Yale* and *Princeton* following in the order named. *Michigan's* representation has increased from 394 to 505 in two years, while the other western universities—*California, Illinois, Ohio* and *Wisconsin*—and the *University of Virginia* attract only a few students from this section of the country. *Harvard* continues to lead in all of the New England states, with the exception of Connecticut, where *Yale* naturally has the largest following. *Columbia* and *Cornell,* as we should expect, have the largest representation in New York state, *Yale, Harvard, Princeton* and *Michigan* following in the order named, as they have during the past two years. *Michigan's* increase in this state—from 195 to 277 in two years—is noteworthy. In New Jersey there has also been no change during the past two years, the order still being *Columbia, Princeton, Pennsylvania, Cornell, Yale, Harvard.* The *University of Pennsylvania* naturally leads in its own state, followed by *Princeton, Cornell, Yale, Harvard* and *Columbia,* as heretofore.

Examining the attendance of the colleges from these states, we note that the order for the entire division is *Dartmouth, Brown, Lehigh, Amherst, Williams. Dartmouth* continues to lead the colleges in Maine and Massachusetts—*Harvard* being the only one of the universities having a larger following in these states than the New England college in question—as it does in New Hampshire and Vermont. *Brown* and *Harvard* are the only institutions that attract students from Rhode Island in any considerable number. In Connecticut the order is *Brown, Williams, Dartmouth, Amherst,* all of the eastern universities, except *Princeton,* having a larger representation in this state than any of the New England colleges included in the table. *Dartmouth, Lehigh* and *Williams* show an increase in their representation from the North Atlantic states, while *Amherst* shows a slight decrease. In New York the order for the colleges is *Williams, Amherst, Dartmouth, Brown, Lehigh,* and in New Jersey *Lehigh, Williams, Brown, Amherst, Dartmouth.* Of the four New England colleges here included, 36 per cent. of the students of *Amherst,* as against 43 per cent. last year, have their permanent home in Massachusetts; 21 per cent. of *Dartmouth's* student body, as against 24 per cent., come from New Hampshire (27 per cent. as against 32 per cent. from New Hampshire and Vermont), and 20 per cent., as against 21 per cent., of the student enrolment of *Williams* hail from Massachusetts. In other words, each of these three New England colleges shows an increase in the proportion of students coming from without the borders of its own state. *Lehigh* shows a decrease from 60 per cent. to 58 per cent. in the number of students hailing from Pennsylvania, while *Brown* draws 53 per cent. of its student body from Rhode Island. The table furthermore shows that *Dartmouth* attracts more students from Massachusetts than from all of the other states in the North Atlantic division combined, *Wil-*

liams draws more from New York than from Massachusetts, while *Princeton* draws more from Pennsylvania and more from New York than from New Jersey.

Of the eastern universities, *Pennsylvania* continues to have the largest percentage of enrolment from its own state, namely, 69 per cent., as against 67 per cent. last year; of *Columbia's* student body 64 per cent. come from New York state, as against 66 per cent.; *Cornell's* percentage of New York students continues at 56 per cent.; of *Harvard's* students 53 per cent., as against 54 per cent., are residents of Massachusetts; of *Yale's* students 34 per cent., as against 33 per cent., have their permanent residence in Connecticut, and finally, of *Princeton's* students only 21 per cent., as against 20 per cent., are residents of the state of New Jersey. The only institutions of this group which exhibit a gain in the percentage of students from outside their own state are therefore *Columbia* (2 per cent.) and *Harvard* (1 per cent.).

Coming to the South Atlantic division and taking into consideration only the six eastern universities, we note that *Harvard's* registration from this section now exceeds that of *Columbia*, the order this year being *Cornell, Pennsylvania, Harvard, Columbia, Princeton, Yale.* The *University of Virginia* naturally has the largest following in this section; *Michigan* is the only one of the western universities represented in the table to make a fair showing in these states, while *Lehigh* is the only one of the colleges with a good representation from this division, its main strength lying in Maryland and the District of Columbia. *Lehigh*, in fact, has a larger following in this section than either *Princeton, Yale* or *Michigan.* So far as the individual states are concerned, *Pennsylvania* leads in Delaware, *Cornell* in the District of Columbia, *Virginia* in Florida, *Columbia* in Georgia, North Carolina and South Carolina (with *Virginia*), *Lehigh* in Maryland, and *Virginia* in its own state (with *Cornell* second) and in *West Virginia.* Leaving the state of Virginia out of consideration, both *Cornell* and *Pennsylvania* have a larger clientele in the South Atlantic division than *Virginia.*

In the South Central division *Virginia* heads the list, followed by *Harvard* (102, as against 80 two years ago), *Cornell* (93–76), *Columbia* (83–72), *Yale* (79–80), *Michigan* (68–64), *Pennsylvania* (61–44), *Princeton* (55–72) and Illinois (48–47). *Wisconsin's* representation from this section has increased from 8 to 22 in one year, while *Lehigh's* has dropped from 15 to 8. The New England colleges and *California* have only a small following in the states in question. The above figures show that *Princeton's* clientele in this division has fallen off during the past two years, while *Yale's* has remained stationary. The largest representation in the individual states is found at the following universities: Alabama—*Virginia, Columbia, Pennsylvania;* Arkansas—*Virginia, Illinois;* Indian Territory—*Illinois;* Kentucky—*Virginia, Harvard, Yale;* Louisiana—*Harvard* and *Virginia;* Mississippi—*Virginia, Cornell, Columbia;* Oklahoma—*Michigan, Harvard;* Tennessee—*Virginia, Yale, Harvard;* and Texas—*Cornell, Yale, Harvard* and *Pennsylvania.* Kentucky continues to send by far the largest delegations to the institutions mentioned in the list, followed by Texas, Tennessee and Alabama.

In the North Central division the four universities of that section, *Illinois, Wisconsin, Michigan* and *Ohio,* naturally have the largest clientele, standing in the order named; *Michigan* was at the head of the list last year. Of these four institutions *Michigan* draws the largest percentage of students from outside of its own state, 55

per cent. of its enrolment hailing from Michigan, the corresponding figures for *Wisconsin, Illinois* and *Ohio* being 82 per cent., 84 per cent. and 91 per cent., respectively. The clientele of the three middle western state universities last mentioned is, therefore, much more local in character than that of any of the eastern institutions comprised in the table, whereas *Michigan* attracts a larger percentage of students from outside of its own state than do *Pennsylvania, Columbia, Cornell* or *Lehigh*. Of the eastern universities *Yale* still has the largest clientele in this section of the country, followed by *Harvard, Cornell, Columbia, Princeton* and *Pennsylvania*, as last year. The largest gains in individual states (15 or over) during the past two years have been made by *Columbia* in Wisconsin, by *Harvard* in Missouri, by *Pennsylvania* in Ohio, and by *Yale* in Ohio, the greatest loss being that of *Harvard* in the state last mentioned. *Columbia's* representation in this group of states has grown from 262 to 329 in two years, *Pennsylvania's* from 139 to 176, *Yale's* from 506 to 577, while *Cornell's* has dropped from 381 to 377, *Harvard's* from 526 to 522 and *Princeton's* from 209 to 184. Of the New England colleges *Dartmouth* has the largest following in the North Central division, with *Williams* second and *Amherst* third, *Brown's* representation being small. The representation of *Amherst* in these states has grown from 43 to 62 during the past year, that of *Dartmouth* from 91 to 122, while that of *Williams* has remained stationary at 86. *Lehigh* exhibits an increase from 6 to 13. *California* and *Virginia* have a smaller following in this division than any of the eastern universities or colleges, with the exception of *Brown* and *Lehigh*. Leaving the *University of Illinois* out of consideration, *Michigan* has the largest following in Illinois, followed by *Wisconsin, Yale, Harvard, Cornell*, each of which has over one hundred students from this state. *Michigan* also leads in Indiana, followed by *Illinois, Columbia, Harvard, Wisconsin*. In Iowa the order is *Wisconsin, Illinois, Michigan, Harvard, Yale, Columbia;* in Kansas—*Michigan, Illinois, Yale, Harvard;* in Michigan (leaving the state university out of consideration)—*Yale, Cornell, Illinois, Columbia, Wisconsin, Harvard;* in Minnesota—*Yale, Harvard, Wisconsin, Columbia, Michigan;* in Missouri—*Michigan, Yale, Harvard. Illinois, Columbia;* in Nebraska—*Wisconsin, Michigan, Yale, Illinois, Columbia;* in North Dakota—*Wisconsin, Columbia;* in Ohio (leaving the state university out of consideration)—*Michigan, Yale, Harvard, Cornell, Columbia;* in South Dakota—*Michigan, Wisconsin, Illinois;* and in Wisconsin (leaving the state university out of consideration)—*Illinois, Michigan, Columbia, Harvard, Yale*. The main strength of *Amherst, Dartmouth* and *Williams* in this division lies in the state of Illinois. Excluding in each case the respective state university, the state of Illinois is represented by 1,110 students at the institutions mentioned in the list, Ohio by 1,076, Wisconsin by 252 and Michigan by 215, *i. e.*, 63 per cent. of the state of Ohio's representatives at all of the institutions included in the table are enrolled at the state university, while the percentage for Illinois is 74 per cent. and for Michigan and Wisconsin it is 92 per cent., as last year.

In the western division (leaving *California* out of consideration) *Michigan* continues in the lead, with *Harvard* and *Columbia*, each of which attracts over one hundred students from this section, following; then come *Yale, Cornell, Illinois, Pennsylvania, Wisconsin, Princeton*, the order being identical with that of last year, with the exception of *Wisconsin*, which has passed *Prince-*

ton. The remaining institutions attract only a few students from this section of the country, with the exception of *Dartmouth,* which continues to draw a fair delegation from Colorado. *Michigan* has grown from 134 to 155 in two years; *Harvard* has remained stationary at 126; *Columbia* has dropped from 111 to 105; *Yale* has grown from 78 to 99; *Cornell* from 76 to 86; *Illinois* from 41 to 53; *Pennsylvania* from 22 to 40; while *Princeton* has dropped from 41 to 36. *Michigan* leads in Arizona, Idaho, New Mexico and Wyoming, although the representation from each of these states is quite small; in California (leaving the state university out of consideration) *Harvard* continues to lead, with *Yale, Columbia* and *Michigan* following; in Colorado the order is *Michigan, Yale, Harvard, Columbia;* in Montana, *Michigan, Columbia, Wisconsin; California* leads in Nevada; in Oregon the order is *California, Cornell, Harvard* and *Yale;* in Utah—*Columbia, Michigan, Pennsylvania;* and in Washington—*Harvard, California, Illinois* and *Michigan.* Of the states in the Western division, Colorado and California continue to send by far the largest delegations to the eastern institutions in the list. California sent 164 students to the institutions outside of its own state represented in the tables of 1906 and 1907 in the former year, as against 191 in the latter, showing that the San Francisco disaster did not seriously affect the attendance of California students at institutions in the east and middle west. It should be pointed out again in this connection that the figures for most of the state universities, and this applies particularly to the *University of California,* are not absolutely reliable, inasmuch as students frequently claim the state in which the university is located as their permanent residence (although in fact it is only a temporary one), in order to be exempt from tuition fees. In addition a tendency exists at all of the institutions to give the place in which the college or university is located as the home address.

Cornell continues to lead in the number of students from the insular possessions, followed by *Illinois.* Alaska, which had a solitary representative in Princeton in 1905 and none whatever in 1906, has three representatives in California this year. *Harvard* leads in the Hawaiian Islands, *Illinois* in the Philippine Islands, and *Cornell* and *Michigan* in Porto Rico. There are less students from the Hawaiian Islands at the institutions represented in both tables this year than there were last. The delegation from the Philippine Islands has increased 25 per cent., while that from Porto Rico has remained stationary.

The total number of students from foreign countries in attendance at the institutions represented in the accompanying table as well as in that of last year has grown from 792 to 897, a growth of no less than 13 per cent., to which the various continents contributed as follows: North America's representation has grown from 286 to 305; South America's from 62 to 87; Europe's has dropped from 211 to 190; Africa's from 15 to 12; Australasia's from 47 to 44, while Asia shows the largest gain —one from 171 to 256. *Pennsylvania* has the largest foreign clientele this year, followed by *Columbia, Cornell, Harvard,* each of which attracts more than one hundred foreigners. Of the western institutions, *Michigan* continues to have the largest foreign clientele, followed by *California, Ohio, Wisconsin, Illinois. Virginia* and the New England colleges attract only a few students resident in foreign countries, while *Lehigh* continues to have a fair foreign representation. Examining the foreign delegations at the different institutions by continents, we note that the order in North

America is *Harvard, Pennsylvania, Cornell, Columbia, Yale, Michigan;* in South America—*Cornell, Pennsylvania, Columbia* and *Ohio;* in Europe—*Pennsylvania, Columbia, Harvard, Cornell, Yale;* in Asia—*Columbia, Yale, Cornell, Harvard, California;* in Africa *Harvard* leads, while in Australasia *Pennsylvania* alone has a good representation. The countries of North and Central America naturally continue to send the largest foreign delegations to the institutions represented in the tables of 1906 and 1907, but Asia has passed Europe, and South America has increased its delegation by 40 per cent. As for individual countries, there is no change in the order for Canada, namely, *Harvard, Columbia, Cornell* and *Yale; Pennsylvania* continues to have the best Central American representation; *Cornell* attracts the largest number of Cubans and of Mexicans, and *Pennsylvania* the largest number of West Indians. Of the North American countries, Canada sends the largest delegation—177—followed by Cuba with 47, and Mexico with 44. Counting only the institutions represented in both this and last year's table, the Canadian representation shows an increase of 13, while Cuba exhibits a slight gain and Mexico a small loss. *Cornell* leads in the Argentine Republic and Peru; *Pennsylvania* in Brazil and Chili; *Columbia* in Colombia and Ecuador. Of the South American countries, the Argentine Republic sends the largest delegation, followed by Brazil, the position of these two countries having been reversed since last year.

In the European countries that send ten or more students the order is as follows: France—*Pennsylvania, Columbia* and *Harvard;* Germany—*Columbia, Pennsylvania* and *Michigan;* Great Britain and Ireland—*Harvard, Pennsylvania, Columbia* and *Yale;* Russia—*Pennsylvania, Columbia, Cornell; Pennsylvania* leads in Holland and *Yale* in Turkey. England sends the largest number, namely 50, followed by Germany with 30, France with 22, and Russia with 19. Of the Asiatic countries, Japan sends 116, China 84 and India 39, both China and India having more than doubled their representation at the institutions contained in both this and last year's tables, while Japan's delegation has remained practically stationary. A number of residents of Asiatic Turkey were represented last year under Turkey in Europe, which accounts in part for a number of the changes affecting the respective representations from the two continents in question. *Harvard* draws the largest number of students from *China, Cornell* from India and *Columbia* from Japan. Practically all of the members of the Australian and New Zealand delegations in *Pennsylvania* are enrolled in the dental school, where most of this institution's foreigners are registered. In fact, the greatest percentage of foreign students enrolled in the universities of the United States is found in the professional and graduate schools; if these were omitted in the figures here given, the showing of the larger universities especially would be changed considerably.

Rudolf Tombo, Jr.,
Registrar
Columbia University

THE RELATIONS OF THE ENGINEERING SCHOOLS TO POLYTECHNIC INDUSTRIAL EDUCATION[1]

The impulses which caused the settlers of New England to found schools and colleges simultaneously with clearing the land for their dwellings seem to have universally affected the pioneers of this country,

[1] Address of president of the Society for the Promotion of Engineering Education, delivered at Cleveland, O., July 2, at the annual meeting of the society.

and the establishment of schools has played a notable part in their policy. The hardy frontiersman has seldom blazed a trail which schools have not promptly followed.

This regard for school education is not singular with the American people, but it has been singularly universal with them, and a comprehensive educational system has resulted which reaches even to the remote byways of the country. An educational system which meets the needs of the country, however, must be something more than a mere comprehensive school system in touch with the people. It must not only offer education in general, but it must also offer those special educations which are necessary for the fullest development of each branch of human endeavor and service. In satisfaction of this condition, the great variety of professional schools have been established—divinity schools, law schools, medical schools, schools for the professional engineer—and, on the other hand, trades schools of various characters. In the latter respect, however, this nation has been at fault. Some trades schools have been established and maintained, and manual training has come to be highly regarded—perhaps here and there too highly regarded in the high schools, though insufficiently established in the grade schools; but the development of trades schools has been insufficient to the country's need, and foremen's schools are still almost unknown.

A wise enactment looking towards the establishment of these schools throughout the nation was passed by the national congress during the period of the civil war, whereby each state of the United States was allotted an acreage from the national public lands in proportion to its national representation, the proceeds to be applied more particularly to instruction in agriculture and the mechanic arts, without excluding other subjects of study. This wise enactment, born in the midst of civil strife, has been the foundation of many of the great state universities which make a notable feature of various of our western states. The United States Congress of recent years has added continuing appropriations of money for the same purposes, but more particularly with the design of supporting agricultural research.

These appropriations have been used with wisdom and with great advantage to the nation and its people; but, as far as mechanic arts are concerned, the term has been construed liberally and the work of the colleges using these appropriations has been largely in the grade of professional engineering work, or trending in that direction. The demand for university-trained engineers has been marvelous and the "land-grant" appropriations have been insufficient to support more than one educational effort in this line, and in many states they have been insufficient to support even one fully, so that it has been excusable in the past for the state colleges and universities to limit their activities. The diversion of fine private bequests from their apparently intended use for the foundation of trades and foremen's schools, to a support of attempted professional engineering schools alongside of engineering schools already in existence, seems to me not so excusable.

In agriculture, the situation has been different. The individual farmer, as a rule, is unable to carry on extended and expensive experiments for the benefit of himself and his fellows, and the agricultural schools have turned their attention toward helping the individual farmers or dairymen by teaching them how best to carry on their trades. Some of our best schools of agriculture are what, in industrial lines, would be called foremen's schools, that is, they teach of the particular craft involved

and the way in which the craftsmanship may be most advantageously invoked and applied by a master craftsman in every-day employment. These agricultural schools also support courses of instruction in scientific agriculture which are of university grade, and they maintain extensive and well-manned departments of research which have returned uncounted advantages for the appropriations expended.

The agricultural schools have thus undertaken to cover a triple field: The field of the master craftsman, the field of the scientific or professional agriculturalist and the field of agricultural research; and, in the main, they are occupying each of the fields well. This is in great contrast to the situation of industrial education, in which schools for master craftsmen—*i. e.*, foremen's schools—are so few as to be almost unknown.

The lead of the agricultural schools arises partially from a lack of farsighted altruism amongst the agricultural people, who clamor for the expenditure of public funds to advance agricultural education in all its branches, and especially those branches that come close home to the individual farmers and dairymen, but are selfishly unwilling to see public funds expended in those lines which appear to immediately aid the manufacturers, who, allege the farmers, are able to help themselves. This line of argument springs from the idea that the prosperity of the country rests upon its agricultural resources; and any one who has lived, as I have, for years amongst the people of the fertile plains of the central west and northwest can not help but be convinced that this line of argument contains much of truth. However, it is false in its premises, because it fails to remember the unassailable fact that the prosperity of the agricultural interests and the concurrent contentment of the agricultural population are dependent in this country to an extended degree on the intelligence and prosperity of the industrial population. The interests of each—the agricultural and industrial populations of this country—are so bound up together, that only by friendly cooperation in most things, including the educational interests, can the highest welfare of either be conserved. It seems to me that it is of almost as much interest to the mechanic or mill foreman that the farmer shall be taught how best to perform his labor to bring forth the largest and best matured crops as it is to the farmer himself. And conversely, it seems to me that it is almost equally to the interest of the farmer and of the industrial foreman that the latter shall be afforded the best available training for the practise of his vocation.

Now, let us turn to consider the relative importance of proper education.

> Upon the subject of education, not presuming to dictate any plan or system respecting it, I can only say that I view it as the most important subject which we as a people can be engaged in.

What Abraham Lincoln thus said in 1832 is even more applicable to the conditions of our times. Only the education to be found in the elementary common schools was probably then in the mind of the speaker, and the extended school educations of a vocational nature, and especially of a professional nature, were apparently not within the purview of his experience; but these were not outside of his horizon, for he would have an extension of that education which leads to morality, sobriety, enterprise and industry, as is shown by another sentence from the same address:

> For my part, I desire to see the time when education—and by its means morality, sobriety, enterprise and industry—shall become much more general than at present, and should be gratified to have it in my power to contribute something to

the advancement of any measure which might have a tendency to accelerate that happy period.

The happy period referred to in this quotation has manifestly made its appearance, but it is right to give sober thought as to the effectiveness of its coming and whether much is not yet to be done to accelerate the period. It is particularly appropriate for us, of this society, to take this sober thought and give consideration to this matter on account of the close relation that engineering instruction ought to bear to the industrial affairs of the nation.

It is a question to be seriously considered whether the faculties of the engineering schools have yet duly recognized the responsibilities for the extension of the education through which comes "morality, sobriety, enterprise and industry," which rest on them because of their relations to industrial affairs. I believe that the agricultural schools, whatever their defects in altruism, have done better through more distinctly recognizing and assuming their part of such responsibilities.

The engineering schools, like their friendly rivals, the agricultural schools, have before them a field which may be divided into three parts—a triple field—two parts being semi-professional or completely professional, and the third vocational and subordinate to the others. The engineering schools have occupied only one effectively, though a few are now growing towards an occupation of the second.

These three parts to which I refer are the divisions of the educational scheme of the nation in which fall: (*a*) engineering research and the advanced professional instruction which is being given here and there to a few graduate students; (*b*) the engineering courses of study as they are now ordinarily planned; and (*c*) the instruction of artisans and especially instruction adequate to the needs of individual foremen or sub-superintendents, that is, master craftsmen.

The second of these educational divisions, in the order here named, it seems to me the engineering schools are occupying very well, but even here there is a lack of effectiveness which seems due to lack of correlation between the schools and lack of study of pedagogic history by those persons responsible for the direction of the schools. Reasonable independence and individuality in methods of teaching are due to the individual men who are experienced and worthy in each school, and the individuality of the several schools must not and can not be infringed; but, unhappily, in the past there have been contrasts of pedagogic views and professional ideals that can not be justified, for in these things (matters of judgment though they be) truth can lie only in one direction, however diverse may be the paths over which it may be approached. In harmonizing these differences, pointing out the better paths to follow, and bringing the professional work of the several schools into correlation with professional practise, and especially in advancing the interests of engineering research and advanced professional studies which go to the solution of those numerous great problems of engineering which can best be solved by men independent of commercial industrial control, but working in full harmony with the best engineers and manufacturers of the day, this society ought to have a large influence. I regret to feel that the society has not heretofore maintained a large influence in these directions, but these matters will be brought before you for discussion in connection with a resolution which I propose to later introduce and in connection with certain proposed constitutional amendments that will come before you.

It is therefore not to these that I am here attempting to particularly direct your attention, but it is to the third educational subdivision that comes distinctly within the purview of the influence and direction of the engineering schools, though preferably not within the scope of their curriculums. This is the instruction for artisans, and particularly the instruction intended for foremen and sub-superintendents.

The reports of the eleventh census give some illuminating figures in regard to the number of skilled workmen and the number of foremen in industrial pursuits. The figures must be admitted to be lacking in precision on account of the difficulty of drawing an exact line of demarcation between skilled and other workmen and the difficulty of phrasing an inclusive definition of the services that make a man of the rank of foreman, but the figures referred to are staggering in their indication of the magnitude of this problem in education.

As a further indication pointing in the same direction, but belonging distinctly in secondary instead of higher education, I will call your attention to the fact that the first Industrial Commission of Massachusetts pointed out in its report of 1906 that there are no less than 25,000 boys and girls between fourteen and sixteen years of age in the state of Massachusetts who are now in various kinds of juvenile employments or are idle, and all of them without any adequate trade education. The secondary industrial schools of the country are utterly without adequacy in numbers or extent to meet this problem in secondary education; and the schools suitably planned for the appropriate education and improvement of foremen are almost unknown with us.

I lay this latter fact at the door of the engineering schools, and hold that the members of the faculties are not guiltless unless they make adequate efforts to get filled this need in education for master craftsmanship in the industries, which comes within the purview of their influence and direction.

The governing boards of the engineering schools must divide the guilt with the faculties, if they continue their common failure to provide sufficient teaching force in the engineering departments, thus putting any effort which reaches beyond the routine of the department curriculum and touches the larger interests of the industrial body beyond the physical endurance of the individual members of the faculties.

The situation is better in our agricultural colleges.

Governing bodies have also been at fault heretofore by too close adherence to a standard for engineering teachers in which mere ability to impart information in the class-room, without consideration of any breadth of ambition, has held too predominant a place in the selection of men; and breadth of view in industrial affairs accompanied by clearness of judgment has had too small a place. I do not undervalue the technical ability to impart information in the class-room and assent that this should be properly given much weight in selecting men for the engineering faculties; but this ability, however largely developed and however fully accompanied by engineering skill, is far from sufficient to make an adequate member of an engineering faculty.

The acts of many governing bodies heretofore are in some degree excusable in consideration of the breathless growth of engineering schools which has seemed to make impracticable any pause for thought or consideration of needs beyond those of the day's pressing want of active teachers and

suitable appliances to give strength to their teaching. It seems to me less excusable that so large a proportion of the leading men in the engineering schools should neglect on their own part a due consideration and study of pedagogic history and the development of the lines of philosophy and sound pedagogic thought, which lead inevitably to broader sympathies and more comprehensive professional views. An engineer who has cultivated a correct professional spirit ought to promptly recognize and fully appreciate the importance of careful study of professional precedents of the best types, and if the engineer is also a teacher, he seems to be under obligation to take a comprehensive view of both sides of his vocation, the side of engineering and the side of education.

I believe that such views lead emphatically to the proposition that engineering schools are called upon to extend their influence so that they will continue their present work of education for the scientific engineer; advance the work of engineering research and advanced professional study; and also foster the establishment, maintenance and development of polytechnic schools for master craftsmen.

As instances of a start in the direction of such polytechnic schools fostered by the faculties of engineering schools, I will point to the Summer School for Artisans at the University of Wisconsin, and the Lowell Institute School for Industrial Foremen at the Massachusetts Institute of Technology. Certain courses of the Pratt Institute are instances of work successfully done in the same direction in an independent school, but even there the work is directed by men who have had experience in the faculties of engineering schools. Such schools supported by endowments or by the state could wisely be founded in each large industrial center, but in each instance the school government needs the combined interest, activity and support of the better manufacturers and of suitable members of the faculty of a great engineering school. It must always be borne in mind that these schools should equally assist the craftsmen, and the industries employing them, and thereby improve the fitness and promote the prosperity of the state.

In the first part of this address I have pointed out that the contrast between the hitherto development of farm and dairy education and industrial foremen's education is partially due to a certain trade selfishness of the farmers; but there are also two other active causes which are particularly strong in the eastern states. One of these is a hesitation on the part of associations of industrial workmen to give countenance to education which cultivates and strengthens the special aptitudes of each man and thus tends to accentuate and enlarge the differences between the abilities, usefulness and earning powers of individuals. This jealousy of education, notable on the part of some, is an unhappy phase of the development of civilization, but right-minded men soon find that appropriate and thorough education for one's particular work not only adds to earning power and ease and satisfaction for the individual, but it also reduces jealousies and tends toward a brotherhood which improves the condition of all workers. We are compelled by the inexorable facts of life to see that men are of different abilities, and nothing is gained by an attempt to deny or evade the truth. The best that we can do is to place each individual man, as far as may be, in the situation that he is best adapted to fill by ability and education. Then the advancement of any individual is a cause for the congratulation of all, for it makes new opportunities all along the line, for each individual to profit

by in proportion to his demonstrated abilities, education and experience, and his readiness to work in cooperative relations with his fellows. For these and many other reasons which show that education is useful to all the men who are willing to profit by it, the organizations and associations of workmen should not oppose, but should favor, the purposes of trades schools and foremen's schools. Happily, the more influential of such organizations are coming more and more to lend their favor to such schools.

This brings me to the second of the above-mentioned contributing causes to the contrast between the condition of development of the agricultural and the industrial schools. Relatively few men have come to large fortunes through agricultural pursuits, but those whose fortunes have been so founded have ordinarily discharged their obligation by extending their personal favor and aid to agricultural education, and through endowments given for the same cause. Indeed, large numbers of men who have only won a fair competency through agricultural pursuits have given liberally of their time and even of money for the encouragement and support of agricultural education, and have seen to it that the expenditures have been made in the manner most useful to the people.

I am sorry to say that the men who have made fortunes through the manufacturing industries and transportation have seemingly not proportionally supported industrial education. Some large endowments and bequests have been worthily bestowed where the income is used in engineering education, and a few endowments are directed toward the support of trades schools, but all that has thus far been done is wholly inadequate and disproportionately small in comparison with the annual returns coming each year from the manufacturing and transportation industries.

The men who have come to wealth through association with these industries seem to prefer to found great art galleries or museums rather than industrial schools. Galleries and museums have been proclaimed more widely, and their needs may have thus been brought more directly to the attention of those who have come to fortune through the industries and have money to bestow. In respect to that, while asserting that I will not take second place to any one in appreciation of the fine influences of art galleries and museums, I also insist that at the present juncture of education in this nation any man with a fortune to bestow can do a more pervading good by aiding the engineering schools to develop the work of engineering research, and by establishing schools for industrial foremen to be directed with the assistance and advice of the engineering schools.

Our communities maintain manual-training schools and here and there a trades school, and great professional engineering schools are maintained in the east by private endowments and in the great states of the west by appropriations from the state governments; but there still remains a gap in industrial education which lies between the elementary trades schools and the professional engineering schools of university grade. This gap must be filled and it will be filled promptly if the men who are and who ought to be members of this society do their duty. It is imperative to give to the thousands of young men who are to make the bulk of the corporals and sergeants of industry that education which makes for self-support in the best sense, makes for proper parentage, and makes for a good grade of thoughtful citizenship (to which foremen's schools may be directed in keen fashion), before the education which

lends figure and charm to a man's recreations (such as so fortunately comes from the art galleries and museums) is taken up. I believe that no use of money can bring greater returns to the state, or greater satisfaction to the giver who understands the educational situation, than large gifts for the purposes of industrial education that I name.

DUGALD C. JACKSON
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SCIENTIFIC BOOKS

Stohr's Histology Arranged upon an Embryological Basis. By Dr. FREDERICK T. LEWIS. Sixth American edition from the twelfth German edition. Philadelphia: P. Blakiston's Son and Company.

At the close of the eighteenth and at the beginning of the nineteenth century, anatomy reached a high degree of development. Soemmering had completed his 'Bau des menschlichen Körpers' and Bichat had given us his master work—'Anatomie générale.' With the completion of the latter the scalpel reached its highest attainment. The microscope, so successfully introduced into anatomical studies by Malpighi and Leeuwenhoek, replaced to a certain extent the scalpel and histology began to occupy a prominent place in the medical curriculum.

In the development of this branch of anatomical study, Würzburg has taken a prominent place. The first name we meet, one now but little known, is Heusinger, called by Hessling 'unser histologischen Nestor.' Some thirty years later, Kölliker published the first and, in some respects, the best edition of his 'Gewebelehre' and now his place is taken by Stöhr.

'Stöhr's Histology' is well and favorably known to American students, not only in the German but also through the English translation. In the previous five American editions but little change has been made from the German. The present edition has been rewritten and 'adapted * * * to American needs.'

The idea of arranging the book on an embryological basis is excellent, but it has not been carried out as thoroughly as it should have been. The book is intended primarily for students of medicine. It is, therefore, eminently proper that human embryology should form the basis of the work. Instead of this, we find the rabbit, the chick and the pig occupying a prominent place; for example, of the five figures to illustrate the formation of the germ layers, only one is taken from a human embryo.

In reviewing an American edition of a German text-book, it is interesting to see to what extent American work is recognized. Kollmann in his recent 'Entwicklungsgeschichte des Menschen' has recognized very generously American work, and the prospectus of the new embryology by Keibel also shows a good American representation. In the American edition of Szymonowicz and of Böhm and Davidoff American investigation occupies a prominent place. Lewis has not been as generous and fails in many places to use available literature.

The work of Mall on the connective tissues is not given as fully as it should have been. Lewis still describes the so-called 'fenestrated membrane' as being perforated, though Mall has shown that this is not the case. No reference is made to the work of Bardeen on the histogenesis of striated muscle, or that of MacCallum on heart muscle. The work of Huber and De Witt on muscle spindles is passed over and no reference seems to be made to the work of Donaldson and his students on the nerves and nerve cells.

That Lewis should make his own work the basis of his description of the lymphatics is very natural and it justly deserves a prominent place, but some reference should be made to the excellent work done on the same subject by Miss Sabin, even though he is not in perfect accord.

The description of the vascular supply of the lymph nodes could be made clearer by using the diagrams of Calvert.

The work of Mall on the spleen is given scanty notice and is dismissed with the statement that Stöhr says: 'a division into lobules

in the interior of the spleen is impossible.' Even though Stöhr can not see the lobules, or structural units of the spleen, they are there, and it is interesting to note that after the publication of Mall's article there appeared in the German edition of Stöhr a diagram which was constructed in accord with Mall's description. If memory serves the writer correctly the lobule of the liver was doubted for many a year.

The development of the alimentary tract in man has been worked out carefully by Mall and his illustrations are very complete, but no reference is made to it. Bensley has also done work of high character on the stomach; this is also ignored.

The work of Mall on the liver came out too late for the present edition, but it is to be hoped that in a future edition it will receive due recognition. The work of Hendrickson on the bile capillaries and on the musculature of the bile ducts should not, however, have been passed by. No use has been made of the work of Opie on the pancreas and the work of De Witt is too recent to be incorporated in the text.

In his statement on page 242 that "atria are not recognized by German writers," Lewis shows a lamentable ignorance of the German literature on the subject. If he will but glance through the volume by Oppel on the organs of respiration or look into Spalteholtz's atlas he will find abundant evidence to the contrary. As was the case with the diagram which Stöhr gives of the lobule of the spleen, so with his diagram of the lobule of the lung; it is constructed after Miller's description, and appeared first after his publication. The fact that a German says a thing is so does not make it so and the converse is true. The writer has a strong admiration for the German worker and what is stated above in no way reflects on his integrity; it only calls attention to the narrowness of many American minds in that they are not capable of judging work on its own merits but must wait and "see what the Germans say."

The vascular supply of the ovary has been followed out from the embryo to the adult by Clark and his diagrams are very helpful to the student; but one looks in vain for any of them.

Flint's work on the adrenal and on the submaxillary gland are apparently unknown to Lewis.

Miss Sabin's work on the medulla is surely worthy of notice in an American edition of any text-book on histology or anatomy, but it, too, is ignored.

There are many other Americans, who have done work which is even recognized by the Germans, who fail to find a place in this American edition of Stöhr.

The book, however, is not without its merits. Lewis has preserved the simple style of illustrations so successfully used in the German editions and, in general, his selection of new illustrations is good. The lettering of figure 147 is incorrect and one wonders just what figure 228 B is intended by the author to represent; but these are inconsequential; probably they, as well as other inaccuracies, have already been noted by the author himself, as he has used the book in his laboratory.

The use of the B. N. A. nomenclature is to be commended.

Lewis deserves much credit for showing us the possibilities of an histology based on embryology. The ideal histology is yet to be written. There is much to be said in favor of a modern book along the lines of Stricker's 'Lehre von den Geweben,' each topic being written by some one who has given special attention to it. The only trouble with this is that it would make too cumbersome a book for the laboratory. Probably a book like Howell's 'Physiology' would be better.

Whatever form the future histology may take, it is to be hoped that more attention will be paid to human tissues than in the past. In the dissecting room the pig and dog have been replaced with the human cadaver. Rabbit, cat or frog histology is not human histology; if, for any reason, it seems best to use these tissues in the laboratory the student should be informed from what animal the tissue is taken and how it differs from the human.

The way may seem clear to Professor Lewis to break away from some other man's foundation and give us a new American histology written on broad and generous lines.

W. S. M.

SCIENTIFIC JOURNALS AND ARTICLES

THE June number (volume 13, number 9) of the *Bulletin of the American Mathematical Society* contains the following articles: Report of the April Meeting of the American Mathematical Society, by F. N. Cole; Report of the March Meeting of the Chicago Section, by H. E. Slaught; "On a Limit of the Roots of an Equation that is Independent of All but Two of the Coefficients," by R. E. Allardice; "On the Distance from a Point to a Surface," by Paul Saurel; "The Calculus in Our Colleges and Technical Schools" (Presidential Address), by W. F. Osgood; "Notes"; "New Publications."

The July number, concluding the volume, contains: "Modular Theory of Group Characters," by L. E. Dickson; "On the Shortest Distance between Consecutive Straight Lines," by Joseph Lipke; "Note on the Commutator of Two Operators," by G. A. Miller; "A Theorem in the Theory of Numbers," by D. N. Lehmer; "Projections of the Globe Appropriate for Laboratory Methods of Studying the General Circulation of the Atmosphere," by Cleveland Abbe; Shorter Notices (Fazzari's Breve Storia della Matematica dai tempi antichi al medio evo, by D. E. Smith; Vessiot's Leçons de Géométrie supérieure, by C. L. E. Moore; Liebmann's Nichteuklidische Geometrie, by E. B. Cowley; Fisher's Introduction to the Infinitesimal Calculus, by E. L. Dodd; Baire's Fonctions discontinues, by W. D. A. Westfall; Campbell's and Cohen's Differential Equations, by C. R. MacInnes; James's Kinematics of a Point and Rational Mechanics of a Particle, and Andoyer's Cours d'Astronomie, by K. Laves; Föppl's Mechanik, third edition, and Gauss's Works, volume 7, by E. B. Wilson); "Notes"; "New Publications"; "Annual List of Published Papers"; Index of the volume.

SOCIETIES AND ACADEMIES

AMERICAN SOCIETY OF BIOLOGICAL CHEMISTS

THE recently organized American Society of Biological Chemists[1] had its first special session in Washington, D. C., May 8 and 9, 1907. Four meetings were held, one of which was in affiliation with the American Physiological Society[2] and another in affiliation with the Washington Section of the American Chemical Society.[3]

Members present at one or more meetings—John J. Abel, A. E. Austin, Lewellys F. Barker, S. P. Beebe, H. D. Dakin, Edward K. Dunham, Otto Folin, William J. Gies, C. A. Herter, Holmes C. Jackson, Joseph H. Kastle, Arthur S. Loevenhart, Graham Lusk, A. B. Macallum, John A. Mandel, John Marshall, Lafayette B. Mendel, Alfred N. Richards, Philip A. Shaffer, Herbert E. Smith, Torald Sollmann, Alonzo E. Taylor, Victor C. Vaughan, George B. Wallace, H. Gideon Wells, C. G. L. Wolf.

Scientific Programs[4]

First meeting

George Washington Medical College. Wednesday morning, May 8.

Presiding officer: The Vice-President, John J. Abel.

JOHN J. ABEL: "On the Behavior of Frog's Muscle toward Acids."

JOSEPH H. KASTLE and H. L. AMOSS: "A New Reagent for the Recognition and Estimation of Free Hydrochloric Acid in Gastric Contents."

JOSEPH H. KASTLE: "Phenolphthalin as a Reagent for Oxidases and Other Oxidizing Substances in Plant and Animal Tissues."

PHILIP A. SHAFFER: "Protein Metabolism in Exophthalmic Goitre."

C. A. HERTER: "On the Bacterial Production of Skatol and its Occurrence in the Human Intestinal Tract."

H. GIDEON WELLS: "The Chemical Composition of the Liver in Acute Yellow Atrophy."

G. VOEGTLIN (by invitation): "The Appear-

[1] SCIENCE, 1907, XXV., p. 139.
[2] SCIENCE, 1907, XXV., p. 861.
[3] SCIENCE, 1907, XXV., p. 969.
[4] Abstracts of the communications appeared in the *Journal of Biological Chemistry*, 1907, III., p. vii.

ance of Millon's Reaction in the Urine, in the Absence of Proteins, as a Criterion in the Tuberculin Reaction."

Lawrence J. Henderson and Charles T. Ryder: "A Method for the Direct Determination of Heats of Reaction."

Alonzo E. Taylor: "On the Conversion of Glycogen into Glucose."

Jacques Loeb: "On the Influence of the Concentration of the Hydroxyl Ions of a Salt Solution upon the Physiological Effects of its Cations."

Holmes C. Jackson and L. K. Baldauf: "Fatty Transformation in the Liver."

J. George Adami and Oscar Klotz: "The Existence of Cholesteryl Esters of the Fatty Acids in Gall Stones and their Bearing upon the Formation of Cholesterin Gall Stones."

Second meeting

George Washington Medical College. Wednesday afternoon, May 8.

Presiding officer: The Vice-President, John J. Abel.

Alexander Lambert and C. G. L. Wolf: "The Metabolism of Nitrogen and Sulphur in Pneumonia."

John Marshall: "A Brief Note on a Source of Error in the Use of a Certain Petroleum Ether as an Extracting Medium."

Herman M. Adler (by invitation): "A Clinical Method for Determining the Alkalinity of the Blood."

A. E. Austin: "Calcium Metabolism in a Case of Myositis Ossificans."

J. A. Mandel and P. A. Levene: "Hydrolysis of Spleen Nucleoprotein."

Henry L. Wheeler and Treat B. Johnson: "A Color Test for Uracil and Cytosin."

Oswald Schreiner and Howard S. Reed (by invitation): "The Rôle of the Oxidizing Power of Roots in Soil Fertility."

Oswald Schreiner and M. X. Sullivan (by invitation): "The Products of Germination affecting Soil Fertility."

Raymond H. Pond: "Solution Tension and Toxicity in Lipolysis."

William H. Welker: "On the Cause of a Red Coloration in the Iodoform Test for Acetone when Applied to Distillates obtained from Urine Preserved with Thymol."

R. F. Ruttan (by invitation): "On the Glycol Fats and the Chemical and Physical Relationship of Cross Fats."

Third meeting

George Washington Medical College. Thursday morning, May 9. Joint session with the American Physiological Society.

Presiding officers: The President of the American Physiological Society, William H. Howell, and the Vice-President of the American Society of Biological Chemists, John J. Abel.

Walter Jones and C. R. Austrian: "On the Occurrence of Ferments in Embryos."

C. G. L. Wolf and Philip A. Shaffer: "Protein Metabolism in Cystinuria."

C. G. L. Wolf: "Protein Metabolism in the Dog."

A. B. Macallum: "On the Glomerular Excretion under Certain Conditions."

C. C. Benson: "On the Composition of the Hourly Excretion of Urine."

S. P. Beebe: "The Inhibition of Tetany Parathyreopriva by Extracts of the Parathyroid Gland."

Victor C. Vaughan: "Proteid Susceptibility and Immunity."

A. D. Emmett and William J. Gies: "On the Chemical Relation between Collagen and Gelatin."

Lafayette B. Mendel: "Embryo-chemical Studies—The Purin Metabolism of the Embryo."

Reid Hunt: "Notes on the Thyroid."

Waldemar Koch: "The Distribution of Sulphur and Phosphorus in the Human Brain."

Fourth meeting

Cosmos Club. Thursday evening, May 9. Joint session with the Washington Section of the American Chemical Society.

Presiding officers: The President of the Washington Section of the American Chemical Society, Peter Fireman, and the Secretary of the American Society of Biological Chemists, William J. Gies.

Joseph H. Kastle: "Chemical and Bacteriological Standards now in Use in Water Analysis."

H. C. Sherman, William N. Berg, L. J. Cohen and W. G. Whitman: "Ammonia in Milk and its Development during Proteolysis under the Influence of Strong Antiseptics."

H. C. Gore: "Studies on Apple Juice."

Hugh McGuigan: "Sugar Metabolism."

Oswald Schreiner and Edmund C. Shorey: "The Presence of Secondary Decomposition Products of Proteids in Soils."

P. A. Levene and W. A. Beatty: "On Lysylglycin."

JACOB ROSENBLOOM and WILLIAM J. GIES: "Some Azolitmin Compounds of Mucoids, Nucleoproteins and Other Proteins, with Exhibition of Products."

WALTER E. GARREY: "Negative Evidence of the Adaptation of Dog's Salivary Secretion to meet the Digestive Requirement of the Diet."

CLARENCE E. MAY and WILLIAM J. GIES: "On the Quantitative Determination of Mucoid in Urine, Blood and Tissue Extracts."

WILLIAM J. GIES (by invitation): "On the Nature and Objects of the American Society of Biological Chemists." (See SCIENCE, 1907, XXV., p. 139.)

Executive Proceedings

Charter members.—The roll of charter members, as announced by the council and ratified by the society, was the following: John J. Abel, J. George Adami, Carl L. Alsberg, Samuel Amberg, Henry P. Armsby, James P. Atkinson, A. E. Austin, Lewellys F. Barker, W. A. Beatty, S. P. Beebe, Francis G. Benedict, C. C. Benson, William N. Berg, Orville H. Brown, Russell Burton-Opitz, Russell H. Chittenden, H. D. Dakin, A. L. Dean, Edward K. Dunham, Cyrus W. Field, Otto Folin, Nellis B. Foster, C. Stuart Gager, Walter E. Garrey, Robert B. Gibson, William J. Gies, H. S. Grindley, John T. Halsey, H. D. Haskins, Shinkishi Hatai, Robert A. Hatcher, Philip B. Hawk, Lawrence J. Henderson, C. A. Herter, Reid Hunt, Holmes C. Jackson, Walter Jones, Joseph H. Kastle, Waldemar Koch, William F. Koelker, P. A. Levene, Jacques Loeb, Arthur S. Loevenhart, John H. Long, Graham Lusk, Francis H. McCrudden, Hugh McGuigan, J. J. Mackenzie, A. B. Macallum, J. J. R. Macleod, John A. Mandel, John Marshall, Albert P. Mathews, Lafayette B. Mendel, Gustave M. Meyer, C. H. Neilson, Frederick G. Novy, W. R. Orndorff, Thomas B. Osborne, William H. Parker, Raymond H. Pond, Franz Pfaff, Alfred N. Richards, Herbert M. Richards, William Salant, Philip A. Shaffer, H. C. Sherman, Charles E. Simon, Herbert E. Smith, Torald Sollmann, Lyman B. Stookey, Alonzo E. Taylor, Frank P. Underhill, Victor C. Vaughan, Alfred J. Wakeman, George B. Wallace, William H. Welker, H. Gideon Wells, Henry L. Wheeler, R. A. Witthaus, C. G. L. Wolf.

Time and place of the next meetings.—On recommendation by the council it was decided to hold the next meetings in Chicago, during convocation week, 1907–8.

Resolutions regarding federal supervision of matters pertaining to public health.—At the joint meeting of the American Physiological Society and the American Society of Biological Chemists (May 9) the following resolutions were adopted by unanimous vote:

"We approve of the movement represented by the Committee of One Hundred of the American Association for the Advancement of Science to increase and coordinate the present activities of the federal government in matters pertaining to public health.

"We therefore urge upon the President of the United States and members of congress the favorable consideration of such legislative measures as are best adapted to secure this result."

Copies of these resolutions were immediately forwarded to President Roosevelt, to members of congress, to the Committee of One Hundred of the American Association for the Advancement of Science and to the permanent secretary of the American Association for the Advancement of Science.

WILLIAM J. GIES,
Secretary

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 431st meeting was held May 4, 1907, President Stejneger in the chair.

Professor W. W. Cooke gave a résumé of the present migration season. He said the spring of 1907 at Washington, D. C., has been characterized by extremes in temperature. The last week in March and the first few days in April were the warmest ever known for the time of year. This excessively warm spell was followed by the coldest April in thirty-five years. It is interesting to note how these variations from normal temperature were reflected in the times of arrival of the birds. Spring opened normally and the birds arrived as usual until the first warm spell of late March, when the Brown Thrasher appeared seventeen days early, and the Blue-

gray Gnatcatcher, sixteen days. During the warm days of early April the Ruby-crowned Kinglet was seen six days ahead of the average date. At the end of the hot wave, April 6, all the birds due were present except the purple martin, due March 28, and not seen until April 5—the latest date for the past seven years. The severe cold spell lasted from April 6 to April 24. During this time only seven species appeared of the twenty species due; one, the spotted sandpiper, a single day late, the others an average of seven days late. During the cold weather, the house wren appeared at several places three days early and a single wandering wood thrush was seen six days ahead of time.

A large wave of migration occurred during the nights of April 25 and 26. Fourteen new species appeared and three more reported the following day very probably arrived a day earlier than they were seen. Thus about one sixth of all the species of migrant land-birds usually seen here during the spring arrived in two days. These arrivals were from two to nine days late. They included all the missing birds except the grasshopper sparrow and the black-throated green warbler, each of which was diligently sought in favorite haunts, but not seen until much later. This pronounced bird wave also brought with it some birds ahead of time, *e. g.*, the kingbird and the scarlet tanager each four or five days early.

After April 27 for the rest of the migration season of 1907 the weather conditions were nearly normal and the arrival dates were quite close to the average; eighteen species averaged three days late, sixteen species three days early and three species were seen on the average date. The average dates referred to have been deduced from more than thirty years records of arrivals in the files of the Bureau of Biological Survey.

Dr. Barton W. Evermann gave a lantern slide lecture on "The Golden Trout and the Southern High Sierra." The investigations which resulted in the discovery of two undescribed species of golden trout of great beauty and value were undertaken by the Bureau of Fisheries at the instance of President Roosevelt, to whom had been represented their threatened extermination. The speaker and his party in the summer of 1904 entered the Kern River region, the native habitat of the golden trout, by pack train, and explored the Kern River basin, obtaining collections of the fishes, particularly the trout. The artist of the expedition made water color paintings of the principal trouts, including the two handsome new species *Salmo roosevelti* and *S. whitei*. Four species of trout of the rainbow series inhabit the Kern River basin. Chiefly in Kern River occurs abundantly *S. gilberti*, a trout without golden colors but from which the three golden trout have descended. The latter have lost the rainbow hues and in part the black spots of the Kern River species and taken on the characteristic golden and allied bright colors. Their separation from the parent stock and from each other is a result of their isolation in tributaries of the Kern, by the formation of impassable waterfalls and by barriers due to volcanic action. The most interesting and strikingly colored species—the most brilliant of its family—the Roosevelt trout, is found only in Volcano Creek. It, together with its congeners of the region, will be exterminated in a few years unless measures are taken to protect it. Fish culture and legal restrictions should combine to perpetuate it. In accordance with the recommendations resulting from the investigations a close season for two years has been established, with continuing restrictions thereafter, and a movement is under way to extend the Giant Forest Reservation to include Volcano Creek.

The 432d meeting and last of the season was held May 18, 1907, President Stejneger in the chair. The evening was chiefly taken up with an exhibition of projection apparatus with short descriptions by members of objects brought by them for illustration. The apparatus combined ordinary, micro, vertical and opaque projection, and lantern slides, microscopical preparations, living fishes and other opaque objects were shown on the screen.

M. C. Marsh,
Recording Secretary

DISCUSSION AND CORRESPONDENCE

DR. MONTGOMERY'S PROPOSED AMENDMENT TO THE RULES OF NOMENCLATURE

DR. MONTGOMERY'S communication to SCIENCE of July 5, seems to be based partly on a misconception of the meaning of the word "indication" in Art. 25, ¶ *a*.

This word is generally understood to cover cases where a name newly proposed is based (1) on a reference to a previously published description or figure; or (2) on a figure accompanying the new name; or (3) on a list of previously established species now first associated in a new group.

That a new name in zoology might be based on a mere reference to an otherwise unnamed specimen in a museum, is a proposition which would hardly be maintained by any one, and which Dr. Montgomery hardly needed to condemn.

But Dr. Montgomery's other suggestion, that a name must be accompanied by a description, and that this description must be "adequate" or the figure "recognizable," is a reversion to a state of mind from which, or rather from the consequences of which, modern nomenclature has been struggling for half a century to free itself. It would perhaps have been as well if the original requirement of some sort of a description had been maintained, not because the description in itself would have been of great value, but because this rule would have eliminated from consideration many publications which have added greatly to the complexity of nomenclatorial problems. However, it is too late now to recede, in regard to this point. But the determination of what is or is not "adequate," or "recognizable," would plunge the investigator into a morass of personal opinions which would render any attempt at a stable nomenclature hopeless. WILLIAM H. DALL

SMITHSONIAN INSTITUTION,
July 9, 1907

THE RULES OF NOMENCLATURE

IN SCIENCE of July 5, Dr. Montgomery so well stated the opinion held by naturalists who require that something more than an "indication" should accompany a name before it merits adoption into zoological nomenclature, that space need not be taken to elaborate his argument, and my purpose is only to lay stress upon an additional need which follows logically.

There will always be many to whom the proposition that in naming systematic groups we are naming objects, not concepts, is philosophically unacceptable, and to these persons concepts must be defined before they can be named. Such naturalists now and always will require that a generic name, like those of higher groups, must be associated with a definition which, as a concession to lack of knowledge at an earlier day, may be incomplete, but must not be actually erroneous or contradictory to the facts which at a later day it is sought to bring under it.

An example of the anomalous and absurd result sometimes reached by the contrary practise under the Draconian law of uncorrected priority is found in the water snakes. This group has been generally known under the name *Tropidonotus* Kuhl (1826). Cope in 1888 substituted *Natrix* Laurenti (1768) on the ground that while *Natrix* was a heterogeneous collection, its type was *Natrix vulgaris* (= *T. natrix*) the type of *Tropidonotus,* and in this he has been followed by some American herpetologists. Now Laurenti's definition of *Natrix* was as shapeless as definitions usually were in his time. Loosely rendered it is: "Head shielded with flat scales; flattened and triangular; the hinder part broad; in front contracted to the snout. Body smooth and shining; narrower behind the head; the middle between the head and end of tail much thicker. Tail conical, elongated and attenuated." The one character of value in identification, "*Truncus glaber nitidus,*" is all there is in the definition that might not be applied to almost any snake known, and yet the method of "type by tautonomy" applies the name to a group having the exactly opposite character of most conspicuously rough, keeled scales. Indeed, few snakes are more at fault with Laurenti's language. Laurenti named under *Natrix* twenty-two species, of which eight are unrecognizable and the re-

mainder are now assigned to eight widely separated genera. Of these the two belonging to *Tropidonotus* are the only ones which fail to correspond to the generic character quoted above. No matter, says the extremist in priority, under the rules they must furnish the type!

It has by now become quite clear that uniformity is not to be reached through any of the codes in use, if indeed it ever can be retroactively established by any other not yet constructed, for there will always be some who will not purchase it at too high a price, and the prevailing demand of the moment forgets that there is value also in diversity. Then again, the uncertainty attending the practical application of some of the rules now most advocated precludes denial.

A high authority in matters of nomenclature, whom we all respect and esteem, has lately said in Science that even elimination can lead to only one result when properly applied—but the trouble is that each eliminator thinks that his way of applying it is the proper one. It is easy to get men to agree to abide by law, but another thing to get agreement as to how the law works.

The devious paths to diverse goals followed by those who have attempted the elimination of *Coluber* Linn. is illuminating as to the certainty of the method—but who shall say, as yet, which one is right?

Cope in 1886 was led by the "rules" to *Natrix* as the proper name for *Coluber*. In 1888 the "rules" led him to substitute it for *Tropidonotus*.

The fact is that meaningless conglomerates such as *Natrix* and many other genera of the early days of zoological classification can not be used now under the rules for determining types without doing occasional violence to intelligence. They never did represent definite conceptions and they ought not to be considered in nomenclature. By consent we allow them to Linnæus, but there is no reason why the privilege should be extended to his successors.

Arthur Erwin Brown
The Zoological Gardens,
Philadelphia,
July 9

THE DISTANCES OF THE FIXED STARS

In various astronomical and other scientific publications misleading statements are frequently made concerning our knowledge of the distances of the fixed stars. In parallax work practically all reliable observations are of a differential nature, and the interpretations of the resulting measures for distance are largely dependent upon preconceived views as to the arrangement of the stars in space.

For some years past I have been engaged in observational and theoretical work on that intricate problem—where is the origin and what is the physical structure of our sidereal system? The results so far obtained are novel, since they indicate that the structure is radial, in other words the stars and nebulas of our system are moving either directly towards or directly away from our sun; the observed deviations from radial motion being attributed to the unsymmetrical distribution of the attracting masses, and also to the presence of bodies having a secondary origin.

The indications also point to the conclusion that, as seen from our sun, a vast majority of the stars and nebulas are confined to a region whose radial depth is much less than the distance of this region from our sun. Since bodies so situated may be comparatively near to us and still have various radial velocities without causing sensible changes in the configuration of the heavens, the seemingly unchanging aspect of the Milky Way[1] and other celestial regions is explained without the necessity of assigning such great distances (and consequently such great masses) to the bodies of our system.

Considering the still undetermined constants entering into the problem, and the lack of a rigorous method for making direct measures, it surely is no exaggeration to say that a trustworthy value of a star's parallax has not yet been obtained.

The award of the Boyden Premium by the

[1] Whether the theory is in agreement with the actual facts or not, I demonstrate that the inclination of the plane (?) of a Milky Way to the plane of the sun's equator is a necessary consequence of such a structure.

Franklin Institute to Dr. Heyl is doubtless a well-deserved honor, but when one reads in SCIENCE for June 28, 1907, on page 1013, that a definitive result is based upon the wholly unproved claim that "the distance of Algol is no less than forty light years" it seems desirable to emphasize the fact that in the present state of our knowledge the approximate distance of any particular fixed star must still be regarded as an unknown quantity.

J. M. SCHAEBERLE

ANN ARBOR,
June 30, 1907

SPECIAL ARTICLES

HENS THAT HAVE LAID TWO EGGS IN A DAY

IT is so generally believed that it is not possible for a hen to lay more than one egg in a day that a few observations that show this is not always true may be of interest.

The number of eggs laid by a hen in a year has been greatly increased, the maximum number reported by Professor Gowell, of the Maine Experiment Station, who has for a number of years been breeding to increase the yearly output, being 255. It would seem that there is no known biological reason why the maximum daily rate should be one each day, any more than that the number of eggs per year should be limited to a few broods. In either case the ultimate limit of *possibility* would seem to depend upon the ability of the individual to assimilate and transform the materials taken as food into the materials of the eggs. There may be difficulties that are not understood that would make it impossible to develop a race of hens that would habitually lay more than one egg in a day, as there have been difficulties encountered in getting birds that will lay every day in the year, but *a priori* there seems to be no known biological reason why a hen should not lay more than one egg in a day.

While experimenting on the fertility of eggs it became necessary to keep a daily record of the hens that laid. This was done by means of trap nests that were arranged so whenever a hen entered a nest a door was dropped behind her that not only kept her prisoner until she was liberated by the attendant, but excluded all others. That is, the door was locked so it would not swing in either direction. The ordinary numbered leg bands were used to distinguish individuals. The birds under observation were White Wyandottes.

The latter part of February or early in March, 1906, a pullet that had recently begun laying apparently laid two eggs in a day. Although it seemed a clear case it was not recorded as it was thought possible that a mistake had been made in reading the number on the band. When the same hen again laid two eggs on March 21, record was made and to guard against possible errors in reading the number on the band she was banded on both legs, thus distinctly marking her, as no other hen in the house had two bands.

During March and April there are records of five days on each of which this hen laid two eggs. Although her record was carefully kept for more than a year and a half, there are no other records of her having laid more than one egg in a day. It should be added that the records of days on which she was known to lay two eggs come during the months of her greatest egg-producing activity. In fact it will be seen that in the thirty-three days listed in the following table the hen actually laid thirty-four eggs.

HEN NO. 1. MARCH, 1906

Date	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Eggs.....	1	1	1	1	1	0	1	1	2	1	0	1	1	1	1	1	1	1	2

APRIL

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Eggs...	0	1	2	1	2	1	2	1	1	1	1	1	1	0

During the year and a half over which my observations extend there have been a number of instances of hens laying two eggs in a day, but the records show that in most cases on either the day before or the day after that on which two eggs were deposited, no egg was laid. Such cases may reasonably be accounted for by supposing premature or delayed delivery, but this can not be true of the hen

whose record has been given, where, for the five days beginning with April 3 and ending with April 7, eight eggs were laid.

There are two other instances where an average of more than one egg in a day for a limited period was made. In both of these cases the possible mistake in the reading of the numbers on the bands is to be considered, as the hens had no other distinguishing mark. The records for the particular period for each of these hens follow.

HEN NO. 27. JUNE, 1906

Date	5	6	7	8	9	10
Eggs.....	0	1	1	2	1	0

HEN NO. 203. MAY, 1907

Date	1	2	3	4	5	6	7	8	9	10	11	12
Eggs..	0	1	1	1	1	1	1	2	1	1	1	Set

There are eight other instances recorded where hens laid two eggs in a day but in all of these cases on either the day previous or succeeding the day on which two eggs were laid, no egg was laid.

It should be distinctly understood that these were not double yolked eggs, which are not uncommon. Usually one egg was delivered in the morning and the other in the afternoon. In all of the recorded cases, the eggs were of normal size and shape and in most cases they were tested and found fertile.

It is worthy of notice, but not necessarily significant, that the single pullet hatched last year from an egg laid by the hen whose record is first given, did not make an ordinarily good record this year.

Gilman A. Drew

University of Maine,
Orono, Maine

On the Origin of Limestone Sink-Holes

The following are some of the statements found in texts and other books relating to sink-holes and their origin:

1. It is for this reason [solution] too that Limestone districts abound with funnel-shaped cavities, descending from the surface vertically into the rock, into which water sinks and disappears. They are often called swallow-holes or swallows. Wherever there was any little despression in which water could lodge, the bottom was eaten away lower and lower, and a pipe formed at last leading from the surface into the undeground channel. ("Physical Geology," Part I., by A. H. Green, p. 191.)

2. In regions of soluble rocks, as we have seen, many inequalities of the surface are brought about by the chemical and mechanical action of underground water. Most frequently the depressions caused by the collapse of subterranean galleries and caves contain no water. ("Earth Sculpture," by James Geikie, p. 282.)

3. In limestone regions the solvent action of water has frequently gone on so extensively as to leave its imprint upon the topographic features of the landscape. . . . Entire landscapes are undulating through the abundance of sink-holes — shallow depressions down through which water has percolated and escaped into the underground passages. ("Rocks, Rock-Weathering and Soils," by Geo. P. Merrill, p. 259.)

4. From the surface sink-holes and pipes are dissolved downward, while in the mass of rock caverns are dissolved out, often, as in the Mammoth Cave of Kentucky, many miles in extent and with rivers of considerable size flowing in them. ("An Introduction to Geology," by William B. Scott, p. 89.)

5. It has been estimated that there are in Kentucky 100,000 miles of subterranean channels sufficiently large to permit the passage of a man. Many "sinks" are found on the surface, due to subsidence. ("A Text-Book of Geology," by Albert Perry Brigham, p. 87.)

6. When a considerable area has thus been undermined, the upper rocks may cave in, thus letting down the surface of the land above. Many small lakes in Kentucky occupy such sink holes. ("An Introduction to Physical Geography," by Gilbert and Brigham, p. 99.)

7. Thus across the limestone upland of central Kentucky one meets but three surface streams in a hundred miles. Between their valleys surface water finds its way under-

ground by means of sink-holes. These are pits, commonly funnel-shaped, formed by the enlargement of crevice or joint by percolating water, or by the breakdown of some portion of the roof of a cave. ("Elements of Geology," by William Harmon Norton, p. 46.)

8. Underground caves sometimes give rise to topographic features which are of local importance. When the solution of the material in a cavern has gone so far that its roof becomes thin and weak, it may collapse, giving rise to a sink or depression of the surface over the site of the original cave. This is so common that regions of limestone caves are often affected by frequent sinks formed in this way. They are a conspicuous feature of the landscape in the cave region of Kentucky, and are well known in many other limestone districts. They are known as *limestone sinks.* ("Geology," Chamberlain and Salisbury, Vol. I., first ed., p. 216.)

9. Sometimes the ceiling [of caves] gives way, forming the funnel-shaped "sink-holes" or "lime-sinks" so familiar in some of the Mississippi valley states. ("Soils," E. W. Hilgard, p. 41.)

Statements 1, 3 and 4 account for sink-holes entirely by solution. Statements 2 and 5 imply that they are due to the collapse of the roofs of caverns. Statements 6, 8 and 9 plainly say that they are due to the collapse of cavern roofs. Statement 7 teaches that some sink-holes are formed wholly by solution, while others are formed by the collapse of cavern roofs.

The writer thinks that he is not mistaken in stating that the common idea of sink-holes is that they are due to the falling in of the roofs of caverns. That sink-holes are sometimes so formed is certain, but that this method of formation is the rare exception and not the rule becomes evident from the following common features of such depressions:

1. Their almost universal funnel shape.

2. The absence in them of coarse débris such as would be derived from the collapsed roof.

Caverns are irregular in shape. The subsidence of the roof, therefore, would produce in nearly all cases a depression of irregular outline. Of many sink-holes the writer has seen, but one is recalled that was irregular in outline instead of being circular or of a form closely approaching a circle. In this single exception, the roof of the cavern had been of sandstone, and the outline of the "sink" was very irregular. In the bottom were large amounts of débris from the former roof. The limestone had been dissolved out beneath the sandstone roof until the latter could no longer support itself, when the collapse took place. Sink-holes of this character would be expected in regions containing limestone caverns if the surface rock above the limestone were thin and consisted of sandstone, or some other insoluble material. But regions where sink-holes are common are those in which limestone is the surface rock.

In no case except the one mentioned has the writer observed coarse débris, such as would be derived from the roof of the cavern, in sink-holes. In course of time such débris would wholly disappear by weathering, but if it had ever existed a portion of it would be expected to remain, in many, if not in the majority of cases.

The claim is not made that limestone roofs of caverns never collapse, for it is reasonable to suppose that they sometimes do. But certainly such collapses are rare. The rule in the formation of sink-holes is that they are the result of solution *at the surface.* Their locations are determined by crevices in the limestone, that permit the localization of the downward-moving water along tube-like passages that are more or less vertical. The water near the surface, in moving toward this tube, enlarges the upper end by solution, forming a small, funnel-like depression. This depression invites more drainage, resulting in a greater amount of solution and the enlargement of the funnel.

Sink-holes sometimes open into caverns below. The entrances to caves are sometimes at the bottom of these depressions. But probably in the majority of cases there are no caverns of considerable size immediately connected with the sink-hole. The tubular drainage course may pass into a cavern some distance away, or issue at the surface as a spring.

Where the latter condition exists, the surface above the subterranean passage may subside by solution, producing a ravine of solution. Thousands of such exist over the limestone region of northern Arkansas and southern Missouri, known in geological literature as the Boone chert area.

These ravines have been discussed by the writer under "Valleys of Solution in Northern Arkansas."[1] Wide observation since the time of writing the above article has confirmed the belief that the ravines have their origin from solution, but has modified the opinion therein expressed as to their method of development. Instead of beginning at the mouth and developing backward, the usual method was that of starting with sink-holes, well up on the hillside. The drainage from these sink-holes was along subterranean, tubular passages, to the bases of the hills. The gradual subsidence from solution, of the rocks above the subterranean drainage lines, resulted in the numerous striking ravines that form such a conspicuous topographic feature of the region mentioned.

A. H. Purdue

University of Arkansas,
Fayetteville, Ark.

[1] *Journal of Geology*, Vol. IX., No. 1, January–February, 1901, pp. 47–50.

QUOTATIONS

THE FUTURE OF THE TROPICS

What the comparatively new science of bacteriology has accomplished for mankind could never have been foreseen a few years back, and even now we probably have a very inadequate idea of its possibilities. The recently expressed opinion of Colonel W. T. Gorgas, that within the next two or three centuries the tropical countries, which offer a much greater return for man's labor than do the temperate zones, will be settled by the white races, and that the centers of population and civilization be transferred to the equatorial regions, may not prove a strictly correct prophecy, but its possibility can not be denied, *a priori*, as once it would have been. The discovery of the malaria germ and of the transmission of it and of that of yellow fever by mosquitoes has abolished the principal drawbacks to the habitability of these regions by the white races to a very great extent, and opened for the use of civilized man large portions of the earth's surface that were formerly practically forbidden to him. The question, of course, still remains to be settled whether the white man can retain his physical stamina and energy through residence in the tropics for many generations, and whether the mere conquest of pathologic germs is all that is required. The productiveness of tropical regions is of itself a drawback. The average man works only from necessity, and what renders mere existence the easier does not necessarily tend to the higher development of the race. It was Sir Charles Dilke, we believe, who once called the banana the curse of the tropics, and held that where it abounded human progress and ambition disappeared. There is some truth in this, but it may not be an absolute truth. It is not likely, however, that the tropics will be the leading centers of civilization in the future. The temperate zones, where the struggle for existence brings out the higher abilities of man, will always dominate, and it is not improbable that the tropics will be the recourse of the pervasive yellow races rather than of the white. There is every prospect that with our almost certain conquest of the pathologic conditions that exist in those regions their utility to mankind will be vastly increased and that higher civilizations than now occupy those lands will be developed. We may not be able to look on the tropics as a permanent home for the best of the ruling white races, even two or three centuries hence, but there is hardly any question but that they will be much more habitable and useful than they have been in the past.—*Journal of the American Medical Association.*

CURRENT NOTES ON METEOROLOGY AND CLIMATOLOGY

ROYAL METEOROLOGICAL SOCIETY'S LECTURES

The Council of the Royal Meteorological Society in 1905 appointed a lecturer "to give information on meteorological subjects to

scientific societies, institutions and public schools in various parts of the country." The object was to advance "the general knowledge of meteorology, promoting an intelligent public interest in the science, and making the work of the society more widely known." This plan has met with marked success. Mr. William Marriott, assistant secretary of the society, who is the lecturer, is now giving lectures on the following subjects: (1) A Chat about the Weather; (2) Weather Forecasting; (3) Rain, Snow, Hail and Thunderstorms; (4) The Upper Regions of the Atmosphere; (5) Clouds, Fog and Sunshine; (6) Climate and Health; (7) Meteorology in Relation to Agriculture; (8) How to observe the Weather. These lectures are all illustrated. The Royal Meteorological Society is also ready to send meteorological instruments and illustrations to any meetings of scientific or other character.

AFRICA AND THE WHITE MAN

The Handbook for East Africa, Uganda and Zanzibar for 1907 notes that more and more European settlers are occupying land in the elevated Kikuyu district, where "one sees now at intervals European farmers with, here and there, rosy-faced children who bear witness to the suitability of the climate for Europeans." This statement is, of course, to be received with caution. The elevated parts of the tropics are well known to be best suited for European settlement, but sufficient time has not yet elapsed to enable us to draw definite conclusions regarding the ultimate effect of the climate upon the white race.

INDIAN METEOROLOGICAL MEMOIRS

VOL. XVIII., Part I., of the *Indian Meteorological Memoirs*, a series of reports of unique value in meteorology, contains "A Discussion of the Anemographic Observations recorded at Rangoon from June, 1878, to October, 1901," and "A Discussion of the Anemographic Observations recorded at Chittagong from June, 1879, to December, 1896," by Sir John Eliot, lately Meteorological Reporter to the Government of India (fol. Calcutta, 1907, pp. 122, pls. XXVII.). These reports are of the same high standard of excellence and thoroughness as that of the volumes which have preceded in this same series. The investigation of Indian meteorology continues with unabated vigor.

RAINFALL OF NORTHERN GERMANY

AN important discussion of the rainfall of northern Germany, by Dr. G. Hellmann, summarizes what the meteorological observations of recent years in that region have brought to light. The title of the work is "Die Niederschläge in den norddeutschen Stromgebieten" (3 vols., Berlin, Reimer, 1906). These volumes afford an excellent illustration of the extreme care and proverbial thoroughness with which German meteorological investigations are carried out. Those who are studying European meteorology or hydrography will find this work indispensable.

MARYLAND WEATHER SERVICE

THE Maryland Weather Service has already published some excellent reports on the climate and weather of Maryland, reference to which was made in these columns at the time of their publication. Dr. Fassig's report on the climate and weather of Baltimore is the most thorough discussion of the kind in this country. Since then, separate chapters on the climate of three counties (Allegheny, Cecil, Garrett) have been issued, and it is intended ultimately to cover every county in the state. The latest publication in the series is that on "The Climate of Calvert County," by C. F. von Herrmann (Maryland Geol. Survey, Baltimore, 1907). The general plan of all these climatic sketches is the same. While there are distinct objections to treating climate according to political divisions, and especially by such small and irrational divisions as counties, there are also a good many arguments, of local value, which may be urged in favor of the plan. In any case, meteorology is the gainer by such publications as those of the Maryland Weather Service. Would that all the states would do likewise.

RAIN-MAKING AGAIN

The compiler of these notes has been requested to act as a director in the "Continental Rain-making Co.," which is to be incorporated in Arizona. From the circulars sent out by the Chief Rain-maker we learn that he "will not be responsible for any storm, flood, or any excesses of nature whatever." "Reliable agents wanted to take up subscriptions in dry sections." "Favorable scientific press comments solicited; unfavorable not wanted." Can not the mails be closed against such swindling schemes as this?

MOON AND CLOUDS

The old question of the supposed influence of the moon in causing a decrease in the amount of cloud has again been investigated, this time by Otto Meissner (*Met. Zeitschr.*, May, 1907). It appears that this supposed cloud-dispelling effect does not exist. Clouds frequently disappear in the evening. When there is a moon, especially a full moon, the clouds can be much more easily seen, and their disappearance makes much more impression than on a dark night.

CLIMATE OF VICTORIA, B. C.

The May, 1907, number of the *National Geographic Magazine* contains a short article on "Factors which Modify the Climate of Victoria," by A. W. McCurdy. The insular position; the proximity of the warm Pacific; the prevailing westerly winds; the local topography and the small precipitation, permitting abundant sunshine throughout the year, are enumerated as the most important climatic controls. Victoria shares with other places along the Pacific coast of North America the advantage of mild winters and moderately cool summers, and it has the additional advantage of being so situated that its rainfall is much less than that of more exposed stations.

SONNBLICK VEREIN

The Fifteenth Annual Report of the Sonnblick Verein, for 1906, is one of unusual value. It contains a presidential address by Dr. Hann on the present aims of meteorological investigation; an appreciative review, by A. von Obermeyer, of the twenty years of meteorological work at Ben Nevis Observatory, with illustrations, and a discussion, by Dr. Hann, of the results of the meteorological observations on the Sonnblick during the past twenty years. The frontispiece is an excellent engraving of Dr. Hann.

NOTES

"Der Meteorologische Aequator im Stillen Ozean" (*Archiv. deutsch. Seewarte,* XXIX., 1906, No. 1) is the title of a very thorough investigation, by R. Westermann, of the conditions of temperature, pressure, rainfall, cloudiness, winds, humidity and ocean currents along the meteorological equator in the Pacific Ocean.

Vol. LXXX. of the Denkschriften of the Vienna Academy of Sciences (*math.-naturwiss. Kl.*) contains a second instalment of Hann's discussion of the daily march of temperature in the tropics. A former publication dealt with the inner portion of the tropical zone; the present one concerns the outer portion (A. *Das amerikanische und afrikanische Tropengebiet*).

An historical review of our knowledge of land and sea breezes, and a presentation of existing theories regarding these winds, has been published in several recent numbers of *Das Wetter*. The final instalment appears in the issue for May, 1907.

R. DeC. Ward

Harvard University

SCIENTIFIC NOTES AND NEWS

Dr. G. W. Hill, of Nyack, N. Y.; M. Camille Jordan, of Paris, and Drs. Guido Castelnuovo and Vito Volterra, of Rome, have been elected honorary members of the London Mathematical Society.

The University of the South has conferred the degree of D.C.L. on President Ira Remsen, of the Johns Hopkins University.

Cambridge University has conferred the degree of LL.D. upon Nicholas Murray

Butler, Ph.D., president of Columbia University.

DR. PHILIP HENRY PYE-SMITH, F.R.S., of London, known for his researches in anatomy and physiology, has been given an honorary doctorate of medicine at the University of Dublin.

THE Norwegian Storting has voted the sum of 40,000 Kroner to Mr. Roald Amundsen in recognition of his services to science in traversing the northwest passage and relocating the magnetic North Pole.

DR. OTTO ZACHARIAS, director of the Biological Station at Plon, and Dr. C. G. Schillings, the African traveler, have been given the title of professor by the German government.

THE Nettleship gold medal of the Ophthalmological Society of the United Kingdom has been awarded to Dr. J. Herbert Parsons, for his work on "The Pathology of the Eye."

THE Royal Academy of Sciences, Berlin, has elected James Henry Breasted, professor of Egyptology and Oriental history at the University of Chicago, a corresponding member.

WE learn from *Terrestrial Magnetism* that Dr. Doberck, having reached the age limit for colonial service, will retire from the directorship of the Hongkong Observatory next September and will be succeeded by Mr. F. G. Figg.

Nature states that the vacancy in the tidal and optical departments of the National Physical Laboratory, occasioned by the appointment of Mr. J. de Graaf Hunter to the post of mathematical expert on the Indian Survey, has been filled by the appointment of Mr. T. Smith, formerly scholar of Queens' College, Cambridge.

DR. HERMANN MUNK, professor of physiology in the veterinary school of Berlin, has retired from active service.

WITH the death of Professor James M. Safford, formerly state geologist of Tennessee, and the decease within the present year of Professor E. T. Cox and Dr. Carl Rominger, Dr. Charles A. White becomes the oldest living geologist of North America. Dr. White is now in his eighty-second year, and is still engaged in scientific work, his latest article being a historical one, on the "Archaic Monetary Terms of the United States," published by the Smithsonian Institution.

ACCORDING to *Nature*, those who have accepted invitations to be present at the Leicester meeting of the British Association, which opens next week, are as follows: Section A: Professors L. Natanson, D. J. Korteweg, H. G. van de Sande Bakhuyzen, Dr. Oskar Backlund, Professor Donner, M. Ch. Féry; Section B: Professors R. Abegg, A. Tschitschibabin, T. W. Richards, A. Werner, F. M. Jaeger; Section C: Professors H. Sjögren, F. Frech, C. Diener, J. P. Iddings; Section D: Professor H. Simroth; Section E: Professors P. Vidal de la Blache, Max Eckert; Section H: Professor E. Naville; Section I: Professor N. Zuntz; Section K: Professors J. P. Lotsy, R. Chodat, H. Conwentz, O. Uhlworm; Section L: Dr. Otto Anderssen, Dr. F. Rönning, Professor M. L. Morel. Corresponding members, Baron D. Kikuchi, Professors P. H. Schoute, R. Nasini and George F. Barker have also expressed their intention of being present.

PROFESSOR E. W. D. HOLWAY and Mr. F. K. BUTTERS, of the University of Minnesota, are spending the summer in the Canadian Rocky Mountains and the Selkirk Mountains, collecting botanical specimens, especially the rusts (*Uredineæ*) and other fungi.

IN connection with the cooperative investigations of the Atlantic Coastal Plain stratigraphy, Dr. H. B. Kummel, state geologist of New Jersey, and Mr. M. L. Fuller, supervising geologist of the investigations for the United States Geological Survey, have taken the field for the purpose of reviewing the Cretaceous, Tertiary, and Pleistocene succession in New Jersey.

THE following course of public lectures is being given in connection with the summer session of Cornell University. The general topic treated is Public Health and Preventive Medicine:

July 8—"The Contribution of Biology to Improved Conditions of Life," Professor Simon H. Gage.

July 15—"The Nature of Infectious Disease," Professor Veranus A. Moore.

July 22—"Tuberculosis," Professor Veranus A. Moore.

July 29—"The Duty of the Teacher in Prevention of Disease," Professor Veranus A. Moore.

August 5—"The Preservation and Purification of Public Water Supplies," Professor Emile M. Chamot.

A COMMITTEE of which M. Emile Loubet, ex-president of the French republic, is chairman, has been formed for the erection of a monument to the late Professor Brouardel. The artist selected for the execution of the work is M. Denys Puech.

DR. WILLIAM L. RALPH, the well-known oologist, died on July 8, at Washington, D. C., in his fifty-seventh year. He was for many years an enthusiastic collector, and early made the acquaintance of Major Bendire, who was then the foremost authority on the subject in this country. On the death of the latter, in 1897, he became curator of the Section of Bird's eggs, in the U. S. National Museum, which post he retained until his decease. His collection, numbering some 10,000 specimens, including many rarities, was deposited in the National Museum several years ago.

SIR WILLIAM HENRY BROADBENT, Bart., F.R.S., a leading London physician, died on July 10 at the age of seventy-two years.

PROFESSOR SIEGFRIED CZAPSKI, director of the Zeiss Optical works at Jena, died on June 29, aged forty-six years.

THE Institution of Mechanical Engineers will hold its summer meeting at Aberdeen from Tuesday, July 30, to Friday, August 2.

THE Royal Society of Medicine, composed by a union of medical societies in London, has received a royal charter. The society begins with a membership of 4,000 and an income of $40,000. Sir William Church has been elected the first president.

THE thirty-sixth annual meeting of l'Association française pour l'Avancement des Sciences will be held in Rheims on August 1–6, under the presidency of Dr. Henrot, honorary director of l'Ecole de Médecine at Rheims. The presidents of the sections are: Sections 1 and 2 (Mathematics, Astronomy, Geodesy and Mechanics), Professor C. Bourlet; Sections 3 and 4 (Navigation and Civil and Military Engineering), M. Bourguin; Section 5 (Physics), Professor Blondin; Section 6 (Chemistry), Professor Hugounenq; Section 7 (Meteorology), M. Luizet; Section 8 (Geology and Mineralogy), M. Peron; Section 9 (Botany), Professor Lecomte; Section 10 (Zoology, Anatomy and Physiology), Professor Caullery; Section 11 (Anthropology), Dr. Guelliot; Section 12 (Medical Science), Professor Landouzy; Section 13 (Medical Electricity), Professor Guilloz; Section 14 (Odontology), M. Francis Jean; Section 15 (Agronomy), M. Armand Walfard; Section 16 (Geography), M. Richard; Section 17 (Political Economy and Statistics), Dr. Papillon; Section 18 (Pedagogy), Dr. Bérillon.

AT a meeting of the board of directors of the American Electrochemical Society, held on June 1, Professor S. A. Tucker, Mr. F. J. Tone and Mr. F. A. J. Fitzgerald were elected to fill the vacancies on the board caused by the election of Mr. C. F. Burgess to the presidency and of Professor Jos. W. Richards to the secretaryship, and the resignation of Colonel Samuel Reber, vice-president, owing to his transference to Manila. Dr. Harrison E. Patten was appointed chairman of the committee on papers. The following were elected as an executive committee: C. F. Burgess, Chas. A. Doremus, Carl Hering, J. W. Richards, E. F. Roeber, S. S. Sadtler, S. A. Tucker.

THE American School Hygiene Association has appointed as delegates to represent at the second International Congress of School Hygiene, to be held in London, from August 5 to 10 the following: Henry P. Walcott, A.B., M.D., president of American School Hygiene Association, chairman of Massachusetts State Board of Health; William Henry Burnham, Ph.D., professor of pedagogics, Clark University; Luther H. Gulick, M.D., M.P.E., director of physical training, New York City public schools; Thomas Darlington, M.D.,

commissioner of health, New York; John J. Cronin, M.D., assistant chief medical inspector, Board of Health, New York City; Robert W. Lovett, A.B., M.D., instructor in orthopedic surgery, Harvard Medical School; R. Tait McKenzie, A.B., M.D., professor and director of physical education, Universiy of Pennsylvania; Edmund J. James, LL.D., president, University of Illinois; Champe S. Andrews, president, Public Health Defense League, New York City; Elliot G. Brackett, M.D., surgeon, orthopedic department, Massachusetts General Hospital; George H. Martin, LL.D., secretary, Massachusetts State Board of Education; Miss Evelyn Goldsmith, teacher in charge of School for Crippled Children, New York City; Miss Jessie Benton Montgomery, principal and critic of grammar department, Wisconsin State Normal School; Miss Brigham, director physical training, Wisconsin State Normal School; Miss Isabel Bevier, professor of domestic sciences, University of Illinois; Francis C. Woodman, head master, Morristown School, Morristown, N. J.; Joseph P. Chamberlain, Santa Barbara, Cal.; Anna J. McKeag, M.D., Wellesley College, Wellesley, Mass.; William Oldright, M.D., Toronto, Canada; F. C. Robinson, LL.D., professor of chemistry and mineralogy, Bowdoin, and member State Board of Health, Brunswick, Me. The international vice-presidents representing the American School Association are Dr. Walcott, Dr. Gulick and Dr. Lovett.

AT the recent Los Angeles meeting of the National Education Association, the board of directors voted that the action of the association in 1898, accepting the simplified spelling of the "twelve words," should be rescinded, and the old spellings of these words adopted for all the association's correspondence and publications. At the final session of the association, however, by a vote of 209 to 22 the following resolution was passed:

> The National Educational Association approves the efforts of the Simplified Spelling Board, and other bodies, to promote the simplification of English spelling by the judicious omission of useless silent letters, and the substitution of a more regular and intelligent spelling in place of forms that are grossly irregular and anomalous, such amendments to be made according to the existing rules and analogies of English spelling, with a due regard to the standards accepted by scholars; and the association hereby approves the simpler forms contained in the list of three hundred words now spelled in two or more ways, published by the Simplified Spelling Board, and containing the twelve simplified forms now used by this association, and directs that those simpler forms be used in the publications of the association in accordance with the rule now in force.

PLANS for the present season's work of the Illinois Geological Survey have recently been adopted and are now being carried out. In the coal investigations Mr. David White, of the U. S. Geological Survey, is making a general investigation of the paleobotany of the coal beds. Mr. F. W. De Wolf, assisted by A. J. Ellis, is making detailed surveys in the southern part of the state and near Springfield. Dr. J. A. Udden and I. J. Broman are making detailed surveys in the area east of St. Louis. Dr. Stuart Weller is extending his systematic researches on the Mississippian stratigraphy. Mr. T. E. Savage is carrying on similar investigations of the Devonian under the direction of Dr. Schuchert. Dr. U. S. Grant, assisted by G. H. Cady, John Udden and others, is investigating the Portland cement materials of the state. E. F. Lines is to study certain clay deposits and H. F. Bain is looking up the oil fields. Professor Salisbury, assisted by Messrs. Trowbridge and Jones, is studying the physiography and Pleistocene deposits of the Wheaton and Springfield quadrangles. In the laboratory, Professor Parr and Mr. W. F. Wheeler are continuing their study of the composition of coals, while Professor Bleininger will assist in the study of cement materials.

Nature states that the New Zealand government is about to undertake extensive trawling of an experimental nature. Mr. L. F. Ayson, chief inspector of fisheries, will be in charge, and Mr. Edgar R. Waite, curator of the Canterbury Museum, Christchurch, has been appointed zoologist to the expedition. Collections will be made of all marine products, which will be investigated, so far as possible,

by New Zealand naturalists, and the material obtained will be the property of the Canterbury Museum. The committee for biological and hydrographical study of the New Zealand coast, appointed by the Australasian Association for Advancement of Science, will provide certain equipment for use in the deeper waters. The *Nora Nevin,* a new steam trawler just from the stocks at Grimsby, England, built to the order of the Napier (N. Z.) Fish Supply Company, has been chartered by the New Zealand government, and it is anticipated that operations will extend over a period of three months.

UNIVERSITY AND EDUCATIONAL NEWS

THE town council of Aberdeen has agreed to give £15,000 towards the erection and equipment of a technical college in the city.

WE learn from the *Experiment Station Record* that at the last session of congress an appropriation of $1,000 was made for the purpose of continuing and extending the school-garden work which has been carried on for a number of years in a cooperative way by the public schools and the Department of Agriculture. Beginning four years ago with a few gardens on the department grounds and a little improvement work around a single school, the movement has grown until this year 700 children have gardens on the department grounds, 124 school buildings in the district have gardens, and 160,000 packets of seeds have been sold for home gardens.

THE registration in the summer session of Cornell University is 745, an increase of more than 100 over last year.

PROFESSOR W. F. M. GOSS, dean of the Schools of Engineering and director of the Engineering Laboratory of Purdue University, has accepted the position of dean of the College of Engineering in the University of Illinois.

AT a special meeting of the trustees of Union College, Schenectady, N. Y., on July 18, the resignation of Dr. A. V. Raymond as president was accepted, and Dr. George Alexander, pastor of the University Place Presbyterian Church of New York, was elected temporary president in his place. Dr. Alexander is a trustee of Union College, from which he graduated in 1866.

AT the University of Virginia, members of the faculty have been elected as follows: Dr. Stephen H. Watts, of the Johns Hopkins University, to be professor of general surgery and director of the hospital; Dr. Thomas Leonard Watson, of the Virginia Polytechnic Institute, to be professor of economic geology, and Dr. Robert Montgomery Bird, to be collegiate professor of chemistry.

PROFESSOR J. B. JOHNSTON has resigned the professorship of zoology in the University of West Virginia to accept the position of assistant professor of anatomy of the nervous system in the department of histology and embryology, University of Minnesota.

PROFESSOR F. G. MILLER, of the chair of forestry in the University of Nebraska, has resigned in order to accept a similar position in the University of Washington. He withdraws from Nebraska on September 1, on which date his connection with the Washington University begins. His successor has already been chosen—Mr. Frank J. Phillips, of the United States Forest Service. Professor Phillips will assume his new duties on September 1, after which his address will be at Lincoln. He is a graduate of the University of Michigan School of Forestry, and has been connected with the U. S. Forest Service for the past four years, during which he has been assigned to forest problems in many places in the western states and territories.

GEORGE D. GABLE, Ph.D., Hunt professor of mathematics and secretary of the faculty, Parsons College, Fairfield, Iowa, has accepted a call to the Johnson professorship of mathematics in the University of Wooster, Wooster, Ohio.

DR. GEORGE DREYER, lecturer in pathology in the University of Copenhagen, has been elected professor of pathology in Oxford University.

DR. CHARLES SPEARMAN has been appointed reader in experimental psychology in University College, London.